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ABSTRACT

The development of a story grammar represents an attempt to describe the higher order cognitive structures that are used to encode, represent, and retrieve information from stories such as folktales or fables. These structures, defined as a set of rewrite rules, specify the types of information that should occur in stories and the types of logical relations that should connect story components. They guide a listener or reader in determining when information, critical to the cohesiveness of a story, has been omitted from a text or when the logical organization of a story has been deviated from the expected sequence of events. Predictions about story memory have been derived from story grammars and tested in several different studies on story memory. The results of these studies have shown the validity of using a story grammar approach to comprehension. Some of the results, however cannot readily be explained by the rules included in current grammars. (These contradictions and developments necessary for a more comprehensive view of understanding are discussed in the conclusion of the paper.) (Author/AA)

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HOW CHILDREN UNDERSTAND STORIES: A DEVELOPMENTAL ANALYSIS

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Abstract

This paper is devoted to the presentation of a story grammar approach to comprehension. The development of a grammar represents an attempt to describe the higher order cognitive structures which are used to encode, represent, and retrieve information from stories such as folktales or fables. These structures, defined as a set of rewrite rules, specify the types of information which should occur in stories and the types of logical relations which should connect story components. They guide a listener or reader in determining when information, critical to the cohesiveness of a story, has been omitted from a text or when the logical organization of a story has deviated from the expected sequence of events. Predictions about story memory have been derived from the story grammar and tested in several different studies on story memory. The results of these studies have shown the validity of using a story grammar approach to comprehension. However, some of the results can not readily be explained by the rules included in the current grammars. A discussion of these contradictions and future developments necessary for a more comprehensive view of understanding are provided in the conclusion of the paper.

Introduction

In the past few years, a productive area of investigation has concerned the process by which children comprehend complex linguistic information, such as a story. Because stories are an integral part of the school curriculum and are told frequently in everyday social interactions, teachers and psychologists have raised questions about those procedures which would ensure a high rate of comprehension for all children. Other important questions to be answered concern methods for evaluating whether comprehension has occurred and training techniques to be used when children fail to understand stories. The goals of this chapter are: to discuss these issues, to provide a review of previous research on children's comprehension of stories, and to give an overview of the field.

A close examination of the linguistic and anthropological literature (Colby & Cole, 1973; Greimas, 1971; Levi-Strauss, 1955; Prince, 1973; Propp, 1958) illustrates that the study of stories has been a major concern for some time. Because stories often contain information relating to the moral codes, values, and social customs of a society (Levi-Strauss, 1955), they served as an excellent source for an examination of the similarities and differences among cultures with respect to these dimensions. In an attempt to investigate the commonalities across different stories, several complex analyses of both story content and structure have been done (Bremmond, 1973; Greimas, 1971; Levi-Strauss, 1955; Prince, 1973; Propp, 1958). Although different in many respects, all lead to similar conclusions regarding the structure of a story. Despite the variation in the semantic content of

stories, these analyses document the existence of stable organizational patterns regarding the types of information included in stories and the logical relations among the parts of a story. Some analyses (Bremond, 1969; Levi-Strauss, 1955) also illustrate how the specific content of stories can be classified into stable, consistent patterns.

In order to substantiate further the claim that a structural prototype for a story exists, Todorov (1969) provided anecdotal evidence that children and adults could easily identify the types of prose which conform to and violate the structure of a story. Todorov also argued that when presented with narratives that do not conform to the specific requirements of a story, listeners will transform, add, or delete information so that the resulting story does conform more to the prototypical structure of a story. Thus, a major implication derived from this study is that a listener has some prior knowledge about the structure of a story, and that this knowledge plays a critical role in determining how a story will be retold as well as determining what types of prose will be classified as stories.

There are two components, however, that are absent from these analyses of story structures. First, none of the descriptions states exactly how pre-existing knowledge of stories influences the comprehension process and second, none of the studies clearly specifies whether the structure of a story lies in the head of a listener or in the text of a story.

In contrast to the linguistic and anthropological studies, a review of the early psychological literature on stories has shown a primary concern with how prior knowledge of stories interacts with memory and comprehension,

but only a general interest in the structural characteristics of a story. Until recently, the sole investigator of the cognitive processes and structures involved in story understanding was Bartlett (1932).

In describing how subjects remembered stories, he came to certain conclusions. Bartlett found that people rarely recalled stories exactly as they heard them. Instead, he observed that transformations of the information often occurred, with new information being added, and some of the original story information being deleted. From these results, he concluded that story memory was not only a function of the organization of incoming information, but was dependent upon the mental operations and cognitive structures already acquired by the listener. He called these structures "schemata," and, his elaboration of the concept of schemata, originally used by Kant and Binet (Anderson, in press; Rumelhart & Ortony, 1976), became one of Bartlett's lasting contributions to the study of psychology. His notion of a schema has strongly and directly influenced recent psychological investigations of story comprehension, as well as studies in other areas of cognition.

To Bartlett, a mental schema represented "an active organization of past reactions and experiences which are always operating in any well-developed organism" (Bartlett, 1932). He emphasized the reciprocal interaction between incoming new information and existing mental structures by stating that incoming information is actively integrated into a subject's mental structure, but at the same time, the presence of new information modifies the old structures. If the same type of information occurs repeatedly, new

structures will emerge from the old and will enable the listener to encode the "new" information more quickly. Bartlett recognized the variability in the process of recalling stories. Although he believed schemata to be stable and shared by individuals within a given culture, he argued that differences in attitudes, interests, affective and cognitive states could also produce differences, and therefore variability, in these structures.

Bartlett made several predictions regarding the interaction between incoming information and prior knowledge structures during comprehension. For example, he stated that when the text structure of a story violated or did not conform to the underlying cognitive structures, story recall would conform more to the prototypical or expected structure than to the actual text structure. However, one cannot predict the type of transformations that would occur in story recall, since Bartlett did not describe further the specific nature of a story schema.

If the process of story comprehension is to be studied systematically, a detailed description of a story schema appears to be necessary. Although several linguistic studies provide detailed analyses of story structures, these descriptions were constructed by analyzing the text structure of many stories. In spite of the commonalities that may exist between the text and underlying cognitive structures used to guide the representation of story material, there is no guarantee that an isomorphic relationship exists between the two. The demands on working memory and the types of strategies used during story encoding and retrieval may limit the types of text structures which can be comprehended with a high degree of accuracy. It is

necessary to formulate a description of the underlying representation of stories, and then to analyze the comprehension of different types of text.

The Development of Story Grammars

Based upon Bartlett's (1932) initial work on story memory and Propp's (1958) morphology of the folktale, Rumelhart (1975) developed a story grammar which describes the underlying cognitive structures used to encode, represent, and retrieve story information. Because Rumelhart's grammar was difficult to use in the analysis of many different stories, several investigators (Glenn & Stein, 1978; Mandler & Johnson, 1977; Stein & Glenn, 1977a; Thorndyke, 1977) modified his grammar so that the underlying representation of a wider variety of stories could be described. These grammars differ from the linguistic study of stories, not only because they emphasize the psychological structures guiding the comprehension process, but also because a set of specific predictions concerning the quality of comprehension can be derived from them.

In order to facilitate an understanding of a story grammar approach, this section will outline the basic assumptions underlying the construction of a grammar, and then illustrate how a listener attempts to break down a simple story into its component parts. The Stein and Glenn (1977a) grammar will be used for illustrative purposes. However, in discussing studies completed on story comprehension in children, an attempt will be made to integrate the findings from all grammatical approaches, especially those of Mandler and Johnson (1977).

The Stein and Glenn (1977a) grammar assumes that some type of schematic representation of stories is used to guide encoding and retrieval of incoming story information. These schemata may be acquired in two ways: through hearing or reading a variety of different stories and by the acquisition of knowledge regarding human social interactions. The latter source of information is important for story comprehension, since stories are similar to the content and structure of social perceptions and human action sequences.

One of the assumed functions of story schemata is to guide a listener or reader in breaking down story information into its component parts. This occurs because the schema specifies the types of information which should occur in a story and the types of logical relations which should link the components of a story. Thus, a story schema guides the listener in determining what parts of the story have not been included and in determining when a story has deviated from the normal temporal sequence of events. One implication is that when the text structure violates the expected story sequence, the resulting representation will tend to correspond more to the expected story sequence than to the original text sequence.

A story schema may be defined as a set of rewrite rules containing knowledge about the generic structure of stories. It is assumed that although there are individual differences in acquired story knowledge, some common type of schematic representation is acquired by all who listen to and tell stories. The development of story grammars illustrates an attempt to describe the general structural characteristics of stories.

Story Analysis: The Single Episode Story

The primary unit of analysis in a story is a category, and several categories occur within a story structure. Each category refers to a specific type of information, and serves a different function in the story. Normally, each sentence in a story can be classified into a particular category. However, the sentence is not the critical variable defining how information is classified into categories. There are instances in which the initial part of a sentence belongs to one category, and the latter part belongs to a second category, depending upon the functional role each portion plays in the story.

A story structure can be described in terms of a tree diagram which is an hierarchical network of story categories and the logical relationships which connect them. (For a detailed description of these structures, see Glenn & Stein, 1978; Mandler & Johnson, 1977; or Stein & Glenn, 1977a.) In order to illustrate how stories are represented, a brief example of the story analysis process is presented. Table 1 lists a description of each of the categories included in a simple story structure and provides an example of how statements in a specific story, "Albert Gets Caught" are broken down into different categories.

Insert Table 1 about here

The initial division of a simple story consists of two parts: a setting plus an episode structure. The setting begins the story with the introduction of a protagonist and normally includes information about the social, physical, or temporal context pertaining to the remainder of the story. The setting is not part of the episode, as it is not directly related to the subsequent behavioral sequence described in the episode. However, information in the setting category may constrain the possible types of behavioral sequences which then occur.

The remainder of the story consists of an episode, the primary higher order unit of analysis. A sequence of five categories is included in the episode: initiating event, internal response, attempt, consequence, and reaction. The initiating event category contains some type of event or action which marks a change in the story environment. Its major function is to evoke the formation of a goal. The goal is included in the internal response category. Internal responses not only include goals, but also include affective states and cognitions, and serve to motivate a character's subsequent overt behavior. Actions referring to overt, goal-directed behavior are defined as attempts. A character's attempts then result in the consequence which marks the attainment or non-attainment of the goal. The final category is the reaction, which includes a character's response to the consequence or broader consequences caused by the goal attainment. It is apparent that each category in the episode logically follows the preceding one. Furthermore, according to the grammar, these categories always occur in a specific temporal sequence.

Several factors signal the ending of one category and the beginning of the next. Temporal markers such as: One day, Suddenly, Finally, etc., facilitate the analysis of a story into its components. However, the semantic content of a statement and the logical relationships among story statements are equally important in determining the classification of story statements into different categories in an episode.

In describing the structural characteristics of an episode, the distinction between the text structure versus the underlying cognitive structure of an episode is critical. There are many stories that have one or two categories in an episode deleted from the text structure. For example, internal responses and reactions are frequently omitted. At times the text structure of an episode begins with the character's internal response and does not include an initiating event. However, it is assumed that although these categories are omitted from the text structure, they are inferred during the encoding process, and are represented in the underlying cognitive structure.

Some episodes in the text omit more than one or two of these categories. In these cases, an episode is considered to be incomplete, since there are three basic requirements which must be met in order for a category sequence to be considered a complete episode. The sequence must contain: (1) some reference to the motivation or purpose of the character's behavior; (2) an overt goal-directed action; and (3) the attainment or non-attainment of the goal. Therefore the categories which must be included in an episode are: (1) the initiating event which signals the reason for the formation of a goal

or an internal response which normally includes the goal; (2) an overt action, signified by the attempt category; and (3) a direct consequence, marking the attainment or non-attainment of the goal.

Multiple Episode Stories

If one examines many different folktales and fables, it is evident that few stories are represented as simply as the structure just described. Most stories contain several episodes, and the individual story can vary, not only in the number of episodes contained in a story structure, but also in regard to the types of logical relations which connect the various episodes. Both the Stein and Glenn (1977a) and the Mandler and Johnson (1977) grammars describe the different type of inter-episodic complexities that occur in stories and provide several analyses of more complex stories. For the purposes of this paper, however, only the types of relations which connect episodes in these multiple episode stories will be discussed.

Any two episodes in a story structure can be connected by one of three relationships: AND, THEN, and CAUSE. The most common relations connecting episodes are THEN and CAUSE. The THEN relation is used when one episode follows a second, where the first episode sets up the necessary preconditions for the second episode to occur; however, the occurrence of the first episode does not directly cause the second to occur. An example of the THEN relation is found in the classic folktale, "Goldilocks and the Three Bears." When Goldilocks enters the bears' home, two episodes occur in succession. The first episode recounts Goldilocks' discovery of the porridge, her desire to eat it, and the act of finishing the baby bear's portion. The second episode

describes her becoming fatigued, the discovery of the chairs, and her action sequence of trying out all of the chairs so that she might rest. In this story, the first episode does not directly cause her behavior in the second sequence, as she might have chosen another course of action after eating. However, the events in the first episode do set up the necessary preconditions for her goal and attempts in the second episode.

The second type of connection, the CAUSE relation, implies a direct connection between two episodes such that the first episode directly ensures the occurrence of the second episode. Certain problems arise in deciding whether episodes are connected by the THEN or CAUSE relation because the perception of a direct causal link is dependent upon the prior knowledge acquired about the events in a story. If more than one alternative episode can be generated after the occurrence of the first episode, the most accurate connection between the two episodes would be a THEN relation. However, if the subject perceives that only one type of episode could result as a function of a previous episode, then the connection between the two episodes is a CAUSE relation. Therefore, the types of relations connecting two episodes are strictly dependent upon the inferences made by a subject during the process of organizing story information, either at the time of encoding the information or during the process of reorganizing story information once encoding has occurred.

The third type of relation connecting two episodes is the AND relation. This type of relation describes a story sequence where two episodes occur in a temporal sequence according to the story time but where the episodes may

have occurred in any order, or may have occurred simultaneously in real time. For example, many stories relate how two characters desire to pursue the same goal, e.g., two knights who want the hand of a beautiful princess. In the beginning of the story, a description containing two episodes may be given explaining why each knight desired the hand of the princess, or how each knight formulated his current goal. These episodes occur in a sequence in the story line, but there is no a priori reason to believe that one episode occurred before another. In fact, many of the rhetorical markers in the story--e.g. meanwhile, at the same time, etc., directly cause the reader to infer that the two episodes were occurring simultaneously. After the two episodes occur, each of them is usually related to a third episode by a THEN or CAUSE relation.

Research on Story Comprehension

The following section is devoted to the discussion of several studies which have attempted to validate a story grammar approach to comprehension.

Temporal Organization of Stories

From the previous discussion of story grammars, it is apparent that the temporal sequence of category information and the logical relations connecting categories are essential to the definition of an episode. In order to validate the rewrite rules defining a story schema, predictions can be made about those story texts which either correspond to or violate the expected sequence in a story. Specific hypotheses and the results from several studies are presented in the following section.

If a story sequence corresponds to the expected sequence, there should be little or no difficulty recalling the temporal order of events given in the text of a story. Data from two recent studies (Mandler & Johnson, 1977; Stein & Glenn, 1977a) support this prediction by showing that children as young as six years make very few errors in recalling the correct temporal order of stories corresponding to the expected sequence. Recall data collected from four and five year-old children (Stein & Garfin, 1977) show that even pre-school children experienced little difficulty ordering the events in a story, provided the story corresponded to the expected sequence. These results are important because they contradict Piaget's (1960) findings of poorly organized story recall in six to eight year-old children. The differences between these two sets of results appear to be a function of story complexity, characterized by both the syntactic structure of sentences and the type of logical relations connecting sentences.

Brown (1975) has also completed a series of studies on children's memory for logically organized sequences. She found that when preschool children were asked to reconstruct a series of logically related pictures, very few errors occurred. However, like Piaget, she found that many preschool children had difficulty recalling the exact order of picture sequences.

The fact that Brown's recall data conform more to Piaget's data than to the results found in the studies by Mandler and Johnson (1977), Stein and Garfin (1977), and Stein and Glenn (1977a) shows the importance of the type of stories used as stimulus materials. In the Stein and Garfin (1977) study, the content of the stories used as stimuli was taken from a group of stories

told by four and five year old children. The stimuli were also constructed to correspond, in every way, to the expected story sequence. Although Brown's picture sequences had an underlying logical coherence, it may be that the picture sequences did not correspond identically to the structure of an expected sequence. Certain categories might also have been missing, and four and five year-olds may not have been able to make the appropriate inferences to fill in the "gaps," leading to a semantically cohesive representation in memory. The high accuracy of reconstruction memory in Brown's study, however, appears to contradict this argument. At present, it is unclear why young children have difficulty with some story sequences and not others. However, the results from the story grammar studies strongly suggest that children as young as four have little difficulty with "well-formed" stories (i.e., those corresponding to the expected story sequence), suggesting that by this age, a story schema similar to the one proposed in the story grammars is used to guide story processing. A more direct test of young children's internal representation of stories may shed light on these issues.

If children have acquired story schemata as described by the grammars, then their spontaneous organization of story material should correspond to the expected story sequence. Furthermore, if children are presented with stories that contain any deviation from the expected sequence, then some type of reorganization of the incoming information should occur so that story recall conforms more to the expected sequence than to the structure in a given text.

In a study conducted by Stein and Glenn (1978) seven and eleven year-old children were given twelve sentences from a well-formed story, similar to the one presented in Table 1. All children were asked to make a "good" story, similar to stories they would either tell a friend or find in a storybook. Each child constructed three separate stories. The results from both age groups showed a significant positive correlation when the constructed orders were compared to the order proposed in the Stein and Glenn (1977a) grammar. However, the results also showed that many of the constructed stories did not identically correspond to the expected sequences. This was particularly true for the younger children. The mean correlations between the constructed and expected story sequences were .44 for seven year-olds and .77 for eleven year-olds.

Two types of errors accounted for the majority of variance found in this task: (1) children constructed stories where statements in the internal response category were placed in positions other than the ones specified in the expected sequence; and (2) children placed consequence and reaction statements in positions other than the predicted order. In most cases, the repositioning of the internal response statements did not disrupt the logical sequence of story events. If the story in Table 1 is used as an example, it can be seen that repositioning statements 5 and 6 so that they occur after statement 7 results in a logical story. Statements 6 and 7 may also be inverted and a semantically coherent story remains. Similarly, the types of errors made in reordering consequence and reaction statements resulted in semantically cohesive stories.

Rather than indicating that young children have not acquired a consistent prototypical story schema, some of the errors indicate the problems associated with defining category membership. The semantic content of a statement is not sufficient for classifying a statement into particular categories. For example, action statements are included in more than one category. Therefore it is not surprising that children reordered some of the story statements.

The more striking finding is that children often inverted affective statements or cognitions with preceding action statements as if they were inferring that a "because" relation connected the two statements. For example, in Table 1 many children ordered statements 9, 10, 11, and 12, by placing statement 10 after statement 12 so that the constructed order read:

Suddenly Albert was pulled through the water into a boat.

Albert felt sad.

He wished he had been more careful.

He had been caught by a fisherman.

The inversion of internal response or reaction statements with action statements may indicate that children can spontaneously infer a "because" relation between two statements so that inverted statements can be remembered accurately. In the studies to be presented later in this chapter, it will be seen that during recall of story material containing this type of inversion, many children do spontaneously insert a "because" relation in order to recall the inverted sequence in the presented order.

Adults' conceptions of "good" stories also have been examined. Stein and Nezworski (in press) completed a study where adults were instructed to recall a "good, coherent" story from texts that did not correspond to the expected sequence. The two types of stories presented were slightly-disordered stories, where one category of story information was moved to a new position within the story, and randomly-ordered stories. Recall of these stories corresponded almost identically to the expected sequence rather than to the text order presented to subjects.

Mandler (1977) also conducted a study where adults were asked to recall specific story violations in such a fashion that the stories would be considered "good" stories. The stimulus materials were constructed by taking a story with two episodes and interweaving statements from each episode so that the resulting story contained a text structure which continually violated the expected sequence of events. She found, like Stein and Nezworski, that adults recalled the stories by separating the statements into two coherent episodes that were identical to the expected story sequence.

The evidence from these studies shows a substantial basis for inferring that the expected story sequence described in the grammar directly corresponds to an adult's conception of a "good" story. The results from the Stein and Glenn (1978) study indicate positive support for this conclusion, especially for older children. However, the variation in reconstruction in the second grade data remains unexplained. Although many of the second grade children constructed semantically coherent stories, some of the constructed stories, if recalled by children and adults, should undergo a greater

reorganization than stories matching the description of an expected sequence. Memory demands and the complexity involved in reconstructing a sequence of 12 lines may have accounted for the variability in some of the orders produced during reconstruction. Young children may not be able to keep track of a logical sequence of this length. Thus, their strategy may be to chunk the sequence into smaller units, adhering to a strict logic within each chunk.

Two studies (Stein & Glenn, 1978; Stein & Nezworski, 1978) then examined second and sixth graders' skill at recalling stories which contained inverted sequences of information, thereby deviating from the rules specified by a story schema. Stories containing inversions can be constructed in two ways. The first method involves simply moving information in one part of the story, say the consequence in an episode, to another position in the episode, without changing or adding any new semantic information to the content of a story. A second method of creating inversions is to change the position of one category, similar to the first method, but also to add rhetorical markers, signaling the occurence of an inversion in the episode. For example, the consequence category in Table 1 could be moved to a position occurring immediately after the initiating event. When the first method of creating inversions is used, no rhetorical markers are added. In the second type of inverted sequence, rhetorical markers would appear after the consequence category so that the story would read:

One day, Albert was swimming around the pond
when he spotted a big juicy worm on top of the water.
Suddenly, Albert was pulled through the water into a boat.

He had been caught by a fisherman.

This happened because ...

and so the story continues by relaying the remainder of the information in the episode, omitting the consequence from its normal position.

The Stein and Glenn (1978) study examined recall of unmarked inverted stories (not containing rhetorical markers). If the grammar is valid, any deviation from the expected sequence of events in a story should cause a reorganization in recall which conforms more to the expected sequence than to the presented text sequence. Furthermore, the recovery of accurate story information may be quite difficult when inversions occur in a text, with recall decreasing significantly when compared to recall of expected story sequences. This implies that if subjects do expect certain types of logical sequences in stories, they may become confused when sequences contrary to expectations occur. As a result of the confusion, they may spend more time on the confusions and not attend to other parts of the story as well. The Stein and Glenn (1978) study showed strong support for the reorganizational prediction and partial support for the prediction concerning the amount of accurate information retrieved during recall.

In their study, Stein and Glenn (1978) constructed nine deviations of an expected story sequence by manipulating the location of three different categories. Each category was placed in three different positions other than its normal location within an episode. For example, the initiating event was placed either one, two, or three locations away from its normal position in the episode. The resulting stories contained sequences with the initiating

event occurring after: (1) the internal response, (2) the attempt, or (3) the consequence. Similar types of story deviations were constructed by moving the internal response and consequence categories to new positions in a story.

The data were analyzed by comparing recall from stories conforming to the expected sequence to recall from story deviations containing temporal inversions. The results showed that reorganization of the text sequence occurred in almost all conditions where stories deviated from the expected sequence. The type of reorganization was specific to both the category moved and the distance each category was moved from its normal location. Independent of the type of reorganization occurring during retrieval, however, recall of the stories conformed more to the expected story sequence than to the presented text sequence.

The amount of accurate information recalled decreased significantly, in comparison to groups receiving the expected story sequence, when either the initiating event or consequence category was placed in a new location. Figure 1 summarizes the mean proportion of accurate recall found in both the control and experimental conditions in this study.

Insert Figure 1 about here

The surprising result from this study was that the internal response category could be placed anywhere in the episode without decreasing the amount of accurate recall. Thus, there may be more variability in

positioning this type of information than a strict reading of the grammar would allow. Another explanation for this finding is that rules for comprehending inverted internal response information may be acquired at a fairly early age.

Marked temporal inversions occur so frequently in stories used in school textbooks that it becomes imperative to examine the effects of these inversions on story memory and comprehension. Marked inversions, in contrast to unmarked inversions, provide a signal that a deviation is occurring in the normal sequence of events. The inclusion of rhetorical markers in a text may also inhibit the initiation of certain processing strategies and direct the listener's attention to the more relevant types of transformations that should be made during the encoding process. For example, if the consequence is placed in a position at the beginning of an episode, followed by a rhetorical marker such as: "This happened because...," the listener immediately becomes aware that the beginning events occurred later in the story sequence. The presence of markers, then, may facilitate the encoding of a cohesive representation of the text sequence so that recall does not decrease when compared to recall of expected sequences.

On the other hand, stories containing inversions, even though well marked, should place greater demands on working memory. The inverted information must be "tagged" in some fashion so that it can be held in memory and retrieved at the appropriate time in order to construct a cohesive logical sequence. The ability to remember these marked inversions may depend upon children's familiarity with deviant structures.

In order to investigate the effects of marked temporal inversions on recall, Stein and Nezworski (1978) conducted an experiment where the position of each of three categories (the internal response, consequence, and reaction) was systematically varied by placing each category in different locations throughout the story. Six and ten year-old children participated in this study. The results, appearing in Figure 2, were provocative both with regard to developmental differences in recall and to the effects of different category movements on recall.

Insert Figure 2 about here

For fifth grade children, all stories containing marked inversions were recalled as well as stories containing the expected sequence of events. Furthermore, three deviations containing marked inversions were recalled significantly better than the expected story sequence. All of these inversions included some movement of the internal response or reaction category. The two movements most effective in increasing recall were those in which the internal response occurred before the initiating event or after a character's reaction at the end of the episode. Recall also increased significantly when the reaction, the last episodic category, occurred before the character's consequence.

The first grade results, however, indicated a different pattern of recall. Although some of the story deviations with marked inversions were recalled as well as stories containing expected sequences, none were recalled

better than the expected sequence. In fact, the majority of inversions significantly decreased recall when compared to the recall of expected sequences. Thus, a significant developmental difference emerged when the effects of marked inversions on story recall were examined. Younger children could not remember deviations from the expected sequence as well as older children.

Younger children may not have acquired a specific set of strategies or rules necessary to guide them in recovering as much of the original story content as older children. These children may be more dependent upon the story following the expected sequence than older children. This explanation for developmental differences in recall has also been given in a study completed by Mandler and DeForrest (1977). They argue that younger children are less familiar with deviant structures, and that their memory is more apt to decline when they are presented with any type of deviation from the expected sequence.

If this assertion is true, then the next question to be raised concerns <u>how</u> children acquire strategies or rules which allow them to maintain a high level of recall when inversions do occur. A second question concerns the order in which these rules are acquired. It is clear that younger children remember some temporal inversions more easily than others. This finding suggests that some inversions may be more easily represented or may require fewer transformations during encoding than other inversions. Piaget (1960) has argued that a definite hierarchy does exist in the acquisition of rules used to comprehend "because" relationships. His data, similar to Stein and

Nezworski's (1978), showed that the first type of "because" relationship remembered was an action-affective inversion. He then illustrated that rules regarding inversions of personal causation events were acquired before rules for inverting sequences relating to physical causality.

At the present time, there is no conclusive evidence that illustrates a definite hierarchy of acquisition rules, primarily because there is a lack of knowledge about children's comprehension and usage of "because." Furthermore, not enough data has been collected to determine what children's conceptions of personal and physical causation are. The first necessary step in investigating this issue is to determine just what events children perceive as being directly related to one another. The types of semantic knowledge structures guiding the perception of causal sequences must be described in detail. Children may comprehend sequences of physical events as well as personal events, depending upon whether the sequence matches the prior knowledge structures they have acquired.

The second step in understanding the acquisition of rules for comprehending "because" relations involves the description of children's knowledge concerning the functional usage of this relation. It may be necessary to determine when young children spontaneously use the "because" relation and what types of information are connected when "because" occurs. If these issues are investigated systematically, then methods for constructing training techniques to ensure comprehension can be developed.

Probability of Accurately Recalling Story Events

Besides regulating the order in which events are expected to occur, a story schema also specifies the type of information which is expected in a story sequence. Both of these factors are important in determining the accuracy of recall. This section will discuss the probability of story statements occurring in recall. The next section will present studies which illustrate how structural variation in stories affects recall.

In the Stein and Glenn (1977a) study, when children heard stories in the normally expected sequence, certain categories of information were always recalled more frequently than other categories. These findings were consistent across the four stories presented and across grade conditions. The most frequently recalled categories were: setting statements introducing the protagonist, initiating events and consequence statements. The least frequently recalled statements were: setting statements describing contextual information, internal responses, and reaction statements. Attempts were recalled with some frequency but never as often as were the most salient categories.

The one exception to the low probability of recalling internal response statements was the salience of the protagonist's major goal. Children in both first and fifth grades frequently included this information; however, all other statements in this category were seldomly recalled, especially by first grade children. A summary of the salience of category recall in the Stein and Glenn (1977a) study is presented in Figure 3. The pattern of recall found by Stein and Glenn (1977a) was similar to that demonstrated by

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Insert Figure 3 about here

Mandler and Johnson (1977). Additionally, Mandler and Johnson showed that although adult recall was better and somewhat different from children's recall, consistent patterns were found across all age groups.

There are several reasons which might account for the saliency of individual statements within an episode. Stories are basically concerned with goal oriented behavior and ideally consist of a sequence of statements directly related to the attainment of the goal. However, statements within each story category can be connected to other statements by relations other than the CAUSE relation, i.e., AND, THEN. It is the type of relation connecting individual category statements and episodes that should determine the probability of statement recall within an episode. If the relations among statements are connected by the CAUSE relation and directly related to the attainment of the protagonist's goal, then story statements have a high probability of being recalled. Statements connected to one another by a THEN relationship should decrease in saliency, and statements connected by an AND relation should be infrequently recalled. Similar predictions can be made about the relative salience of whole episodes in a story.

At the present time, there are no studies which have systematically investigated the effects of varying the types of logical relations connecting statements within an episode. However, Glenn (1977) has manipulated the types of relations connecting episodes, and has shown that stories containing

episodes connected by the CAUSE relationship are recalled significantly better than stories containing episodes connected by the THEN relation.

Two other factors may regulate the salience of certain category information. The first factor concerns the type of integration or summarization of story information that sometimes occurs. Two or three statements can be causally related to one another, but the listener will recall only one statement which is either an integration of the three or a higher order summary statement from which the three statements could easily be inferred.

The second factor concerns the semantic redundancy that can occur between story statements. Although two statements may be causally related to one another, the information in one statement or one category may be directly inferred from the information in other story statements. In this situation, certain story statements become redundant and to recall all of them would create an unnecessary load on working memory.

One method that increases the salience of specific category information is the manipulation of the temporal position of statemments not frequently recalled. The Stein and Nezworski (1978) study showed that certain marked temporal inversions not only increased general story recall above that of expected sequences, but also increased the salience of certain category statements such as the internal response. These types of inversions, while increasing the probability of recalling certain statements, also have important implications for the type of inferences made about the content of a story. An excellent example of this can be seen in a recent study by Austin, Ruble, and Trabasso (in press).

Austin et al. have shown that in stories where a positive intent (a protagonist wants to do something good) is stated before a negative outcome (the consequence of the protagonist's actions is seen as being bad), young children will infer that the character's original intentions were negative. However, when the intentions are moved to the end of the episode, children will maintain that the character's intentions were good despite the negative outcome. Austin et al. attribute the change in moral judgments to the fact that by stating the intention at the end of a story, a recency effect occurs. They argue that this change in the temporal location of the intention causes children to integrate and weight the story information differently than when the intention is placed before the consequence.

The results from the Stein & Nezworski (1978) study also suggest that this effect may occur. However, an additional hypothesis can be made concerning this type of temporal inversion. It can be argued that this inversion may prevent the listener or reader from making an incorrect inference about a possible change in the protagonist's original intention.

Although stories often explicitly state the intent of a character, actions which occur after the protagonist's goal statement can often cause children to make additional inferences about the protagonist's intent in the story. These inferences may become more salient in determining the types of moral judgments made about a character. The inclusion of temporal inversions, especially in connection with intentions, should limit the type of inferences made, ensuring that very specific inferences about intentions will be made. The inversion tells the listener that there was no change in

the protagonist's intentions throughout the story episode. Thus, it is clearly evident from the Austin et al. study and from our results that certain temporal inversions can increase recall and salience of specific statements, in addition to constraining the types of inferences made about story characters.

A second example of the facilitative function of inverting story information may be related to many of the flashback sequences occurring in stories. In some stories, specific obstacles, many of which are life-threatening to the protagonist, must be avoided or overcome. Often children are put in a state of suspense too great to tolerate until the end of the story. Because of children's awareness that the protagonist could suffer real harm, they may not be able to attend to the remainder of the story events. However, if the uncertainty is reduced by placing the consequence near the beginning of the story, the listener is assured of a positive outcome. This inversion may then enable the child to attend more efficiently to subsequent story events.

The Effect of Deleted Category Information

As stated in the previous section, a story schema also specifies the types of information which should occur in the expected story sequence. The implication derived from this assumption is that stories not containing all necessary category information will be transformed so that recall, again, corresponds more to the expected sequence than to the text structure of a story.

In order to test this hypothesis, Stein and Glenn (1977b) carried out an experiment which involved the systematic deletion of each episodic category from a story. By deleting each category from the text structure of a story, the importance of that category could be examined in two ways. When deletions occur, a "gap" is created in the logical sequnce of events. If a schema is activated to guide listeners or readers in organizing the incoming story sequence, then they should attempt to fill in the "gap" during recall by generating new information which perpetuates the logical sequence of events. If the grammar is valid, the majority of new information should replace deleted information. In situations where the listeners have difficulty discerning the exact nature of the mi listeners have difficulty discerning the exact nature of the missing information or they are unable to make inferences about the types of events which could have appeared in that category, the encoding of the story events should be disrupted, thereby decreasing recall of the remaining story information.

There are certain exceptions to the above predictions. Again, most of these exceptions concern the internal response and the reaction categories. As shown by several of the previously cited studies, these two categories are often deleted from the structure of an episode. Because the internal response and reaction categories are among the least well recalled information in an episode, it appears that subjects may have rules which allow them to delete these two categories from recall without disrupting recall of the remaining story information or without adding new information to the episode. Again, the information contained in these categories is

often so apparent from the other events in a story sequence that it becomes redundant to recall them.

The results from the Stein and Glenn (1977b) experiment showed that when initiating events, attempts and consequences were deleted from a story, the number of new statements included in recall significantly increased in comparison to the control group. Also, a clear majority of the new information added to recall matched the type of information deleted from the story. Figure 4 shows the number of new statements added to recall as a function of the category deleted. Figure 5 shows the type of inferences

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Insert Figures 4 and 5 about here

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occurring when each category was deleted from the story. Thus, the tendency to create a coherent logical sequence is quite strong when specific types of information are deleted.

A second finding of importance is that in both grades recall decreased significantly in comparison to a control group when the initiating event was deleted from the story. Recall also decreased in the first grade when the consequence was deleted. The information loss in these conditions may indicate that childrern had difficulty generating new information that was congruent with the entire sequence of events in the story. Often children generated new information that could be connected to specific parts of the original story, but not to other parts. In order to make the story more coherent, some children would then transform more of the original story to

make it conform with the new information they had generated to fit the deleted category.

It can be seen that when certain classes of information are deleted from a story, children will attempt to fill in the missing information, but often at the cost of not recalling other story information. Although this study is only a beginning attempt to investigate the effects of structural variation of stories on children's memory, the results are important in relation to the development of inferential thinking in children.

One of the major functions of inferences is to disambiguate certain types of story information or to resolve apparent contradictions in the story. Trabasso and his colleagues (Trabasso, Nicholas, Omanson, & Johnson, 1977) have also made a similar argument. After making an initial set of inferences about incoming information, listeners often can integrate this information into prior world knowledge about stories. In the process of this integration, listeners may have a feeling of understanding a problem in a new frame of reference because of the addition of new knowledge to prior structures.

The presence of ambiguity or contradictions in a text, however, raises an important question concerning recall and comprehension of stories. While these factors might increase the number of inferences made about story events, the amount of accurate information remembered may decrease. Additionally, there may be important developmental differences in the types of strategies and prior knowledge structures used during the comprehension process.

Adults may not initially encode the maximum amount of story detail possible when ambiguities or contradictions occur. However, they are frequently aware that information loss occurs under these conditions, and may have strategies to overcome this problem. Many adults read a story twice: once to understand the plot structure and locate the ambiguities; the second time to locate details that aid in the reduction of ambiguity. At the present time, the exact process by which ambiguity is comprehended is not known. Furthermore, it is not known whether young children can perceive ambiguity in a text and whether they attempt to make inferences about ambiguous or contradictory information.

In an initial study investigating children's ability to understand contradiction, Stein (1977) constructed stories containing extremely discrepant information. Discrepancies were created by describing the personality characteristics of the protagonist in either a very positive or very negative light and then varying the attempts and outcomes of the story. The attempt and outcome were always at odds with the initial character description. For example, one of the stories describes a fox who is very mean and who would never think of helping anyone. However, later in the story, the fox sees a bear who is very weak and looks half starved. The bear is trying to catch a fish for dinner and is having absolutely no luck in getting his supper. The fox walks over to the bear and catches the fish for him and helps him cook it for dinner. The bear is grateful to the fox for doing so. The explicit plans of the fox and the reason for the change in his behavior were never included in the story. Therefore, the story contains incongruent elements.

Children in first and fifth grade were tested on these stories in two different ways. In the first task, they were asked to recall the story exactly as they heard it. In the second task, children were told that there may have been information which was missing in the story they heard, and they were to retell the story, adding anything they thought was missing from the original version.

In the first recall task, a significant number of first grade children simply deleted the initial description of the fox and recalled only the actions and the outcome of the story. Even in recalling the story the second time, there was very little mention of the fox's meanness or lack of desire to help others. These children simply deleted the parts of the story that were incongruous. In the fifth grade, however, most children included the initial description of the fox plus all of the fox's subsequent behavior. In an effort to maintain logical consistency, some of the fifth graders included inferences about the fox's reasons for changing his usual pattern of behavior toward other animals.

During the second recall, even more of the fifth grade children included inferences describing the reasons why the fox had changed his mind about helping the bear. Thus, we can see that children at different age levels respond differently to the conception of contradiction. First graders almost always deleted material to remove the contradiction between the description of the fox's previous behavior and his behavior in the story episode. Even when these children were asked about the initial description of the fox in relation to his behavior in the story, many of the first graders did not see

the necessity of giving an explanation for change in the fox's behavior pattern.

Several possible explanations could account for these findings. First grade children may not have understood that there was any real discrepancy between the initial personality description of the fox and his later behavior. The child's conception of a fox not helping anyone may be limited to specific situations and may not apply to the acquisition of food under starvation conditions. Even though our statement about the fox never helping anyone was unambiguous, we don't know exactly what conception children have of helping. Moreover, even if these younger children understood the contradiction between the previous and later behavior of the fox, they may not have been able to generate a reason for the change in his behavior. Therefore, the most efficient method of constructing the sequence of events would be to delete that information which is not directly related to the remainder of the story content. From the results of this study, it is apparent that the child's concept of contradiction must be defined first so that a more rigorous study of inferential thinking can be completed.

Conclusions

The studies discussed in this paper illustrate the usefulness of a story grammar approach to comprehension and provide support for many of the predictions derived from the development of a grammar. Children, like adults, do expect certain types of information to occur in stories. When stories don't include certain types of information, new information will frequently be added so that story recall corresponds more to the sequence

expected in a story than to the presented sequence. Furthermore, in specific instances, recall decreases when stories don't contain all of the expected information. This decrease may occur either because of attentional difficulties during the encoding process, or possibly because of the inability to generate new information for the purpose of constructing a semantically cohesive representation of the incoming material.

Similarly, specific types of temporal sequences are expected to occur in stories. When stories don't correspond to the expected sequence, as in the case of unmarked story inversions, reorganization of the story sequence occurs so that recall conforms more to the expected sequence than to the presented sequence. The inclusion of specific unmarked inversions in a story also causes recall to decrease in comparison to recall of stories containing the expected sequence. Thus, a story schema can be seen to exert a powerful influence on story recall.

Some of the results from the various studies, however, did not support the predictions derived from the story grammar. Not all five episodic categories need be included in a text for story information to be recalled in a form comparable to stories with all of the expected categories. The internal response and reaction categories could be omitted from the text sequence without causing significant decreases in recall when compared to recall of expected story sequences. Furthermore, children did not attempt to include new information in recall that would fill in the "gap" created by these deleted categories. It was concluded that a set of deletion rules may be used when information in these categories is highly redundant with other story events.

The semantic content of a story was then shown to play an important role in determining whether subjects might add new information to fill in gaps left by deleted category information. If children perceived discrepancies to exist in a story sequence, categories such as the internal response would frequently be added to recall to resolve the discrepancies and to disambiguate the story sequence. The ability to recognize discrepancies and the child's knowledge of discrepant events were also hypothesized to play an important role in predicting whether new information would be added to recall.

Some of the results from the temporal ordering studies did not support the original hypotheses derived from the story grammar. When children were asked to construct "good" stories from a scrambled set of stimulus materials, their stories corresponded positively to the proposed sequence of story events. However, both the internal response and reaction categories were frequently put in positions other than their normal location in an episode. When the internal response category was systematically moved throughout the episode, without marking or signaling its new position, recall did not decrease in comparison to recall of expected story sequences.

Several reasons were given to explain why this category movement did not cause a decrease in recall or why, in a spontaneous story construction task, this type of information was placed in locations other than its normal position. As indicated in several of the cited studies, the internal response category is less frequently recalled in comparison to other categories, even when story texts correspond to the expected sequence.

Because of the redundancy of its content with other story events, placing the internal response in a new location may not cause any confusion to the listener or reader. The occurrence of this category in new locations may simply serve to reconfirm inferences that have already been made from other statements in a story.

Another explanation for the relative ease of recalling this type of category inversion may be related to children's ability to spontaneously infer the appropriate "because" relations between internal responses and other types of category information. Results from a spontaneous story construction task showed that when children constructed their own conception of a "good" story, they often inverted this type of information and appeared to infer that a "because" relation connected the two statements. These data indicate that children may begin to acquire rules to encode specific temporal inversions at a relatively young age.

Marked inverted story sequences had a different effect on story recall when compared to recall of most unmarked inverted story sequences. This was especially true for older children. Fifth grade children recalled as much information from stories containing marked inversions as they did from stories corresponding to the expected sequence. Furthermore, many of the marked inverted sequences increased the amount of story information accurately recalled. In contrast, first graders had difficulty with many of the story deviations containing marked inversions. The difference found between the two age groups was attributed to older children's greater familiarity with the occurrence of deviant story structures.

A child's ability to retain information from stories containing deviant structures may be due to knowledge about the function of specific linguistic devices used to indicate the occurrence of a deviant structure, as well as the acquisition of specific meta-memorial strategies that facilitate the encoding of information from deviant structures. For example, when a flashback occurs in a story, the listener or reader must first recognize that information is being presented in a deviant sequence. In order to do this, the function of linguistic devices, such as rhetorical markers, must be understood. The information which has been inverted must then be identified, "tagged" so that it can be kept in working memory, and retrieved.

One major issue that wasn't discussed in the chapter concerned the order in which marked story deviations would be recalled. Even though fifth grade children recalled information from marked inverted sequences as well as children receiving expected story sequences, the grammar would predict that recall of inverted sequences should be transformed to conform more to the expected sequence than to the text sequence. In the analysis of these data, transformations did occur so that recall often corresponded more to the expected sequence than to the text sequence. However, certain marked inversions were recalled in the presented order. Most of these inversions involved the internal response and reaction categories.

Thus, it is clear from many of the studies that children learn to comprehend stories with deviant structures and eventually learn to represent some of these more complex structures with a high degree of accuracy. It is evident, however, that a clear and consistent explanation of the process of acquiring rules for representing more complex stories is still lacking.

In reviewing studies concerned with children's spontaneous generation of stories (Glenn & Stein, 1978; Stein & Glenn, 1977c), one of the most consistent findings was that the structural complexity of children's stories increased dramatically with age. Young children, around five years of age, often produce stories that are simple reactions to ongoing events. They frequently fail to include evidence of a planful sequence of behavior and simply describe "script" like sequences that are representative of everyday habitual patterns. However, as children develop they begin to include complex goal structures in their stories, social interactions among characters, and dialogues between characters.

The grammars, as they are now formulated, cannot account for all of the variation in structures spontaneously generated by children. Specifically, the current grammars do not describe the types of structures that must be used to comprehend and produce multiple protagonist stories, nor do the grammars contain rules for representing dialogue between two characters. The grammars also fail to indicate the types of changes which occur in story schemata, as a function of age. Clearly, more developmental research is needed to specify the changes which do occur. However, studies which describe the process of change must also be initiated. Although many studies have described the various stages of development, especially in Piagetian terminology, few have attempted a detailed study of the process of developmental change. Only when a description and explanation of the process of change is offered, can adequate instructional methods be developed.

Another important issue which must be studied concerns the definition and measurement of comprehension. The majority of the studies described in this paper used only recall procedures. While recall is important in terms of understanding retrieval processes, this procedure cannot adequately describe all of the story information which may have been encoded by a child. As an example, the results from the Stein and Glenn (1977a) study showed that much of the story information not recalled was, in fact, remembered. Both first and fifth grade children responded with a high degree of accuracy when probed about the protagonist's internal responses, and yet few recalled this information. Stein and Nezworski (in press) have also shown that adults retain some degree of a surface representation of stories violating the expected sequence and that recall undergoes greater reorganization than performance on other tasks, such as recognition or reconstruction.

These findings indicate that the underlying representations of stories are richer in the amount of information and complexity of structure than those produced at recall. Furthermore, they indicate that there are important differences between the use of a story schema during encoding and retrieval. To date, only a few studies have investigated the difference between encoding and retrieval processes (Anderson, 1977). However, if an accurate description of comprehension is to be developed, more studies must be completed.

A more general problem in the study of story comprehension is that the current grammars lack a detailed description of the specific semantic knowledge structure used during comprehension. From analyzing recall data

and from listening to children tell stories (Glenn & Stein, 1978; Stein & Glenn 1977c), it is evident that certain themes occur in older children's stories and are never included in stories by younger children. Although all children might tell stories containing threats to a protagonist's survival, older children include different types of information. The obstacles forseen, the types of plans generated to overcome the obstacles, and whether or not the protagonist succeeds may be a direct function of the age of a child. The comprehension and production of stories depends upon a child's conception of personal causation (De Charms, 1968; Loevinger, 1976) and knowledge about objects, actions, and social situations in general. In order to understand the process of comprehension in more detail, studies which investigate children's knowledge about all of these variables must be initiated.

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Table 1

		Categories Included in a Simple Story
1. Setting	-	Introduction of the protagonist; can contain information about physical, social, or temporal context in which the remainder of the story occurs.
2. Initiating Event	-	An action, an internal event, or a natural occurrence which serves to initiate or to cause a response in the protagonist.
3. Internal Response	-	An emotion, cognition, or goal of the protagonist.
4. Attempt	-	An overt action to obtain the protagonist's goal.
5. Consequence	-	An event, action, or endstate which marks the attainment or non-attainment of the protagonist's goal.
6. Reaction	-	An emotion, cognition, action or endstate expressing the protagonist's feelings about his goal attainment or relating the broader consequential realm of the protagonist's goal attainment.

Example of a Well-formed Story

Setting	1.	Once there was a big gray fish named Albert.
	2.	He lived in a big icy pond near the edge of a forest.
Initiating Event	3.	One day, Albert was swimming around the pond.
	4.	Then he spotted a big juicy worm on top of the water.
Internal Response	5.	Albert knew how delicious worms tasted.
	6.	He wanted to eat that one for his dinner.
Attempt	7.	So he swam very close to the worm.
	8.	Then he bit into him.
Consequence	9.	Suddenly, Albert was pulled through the water into a boat.
	10.	He had been caught by a fisherman.
Reaction	11.	Albert felt sad.
	12.	He wished he had been more careful.

Figure Captions

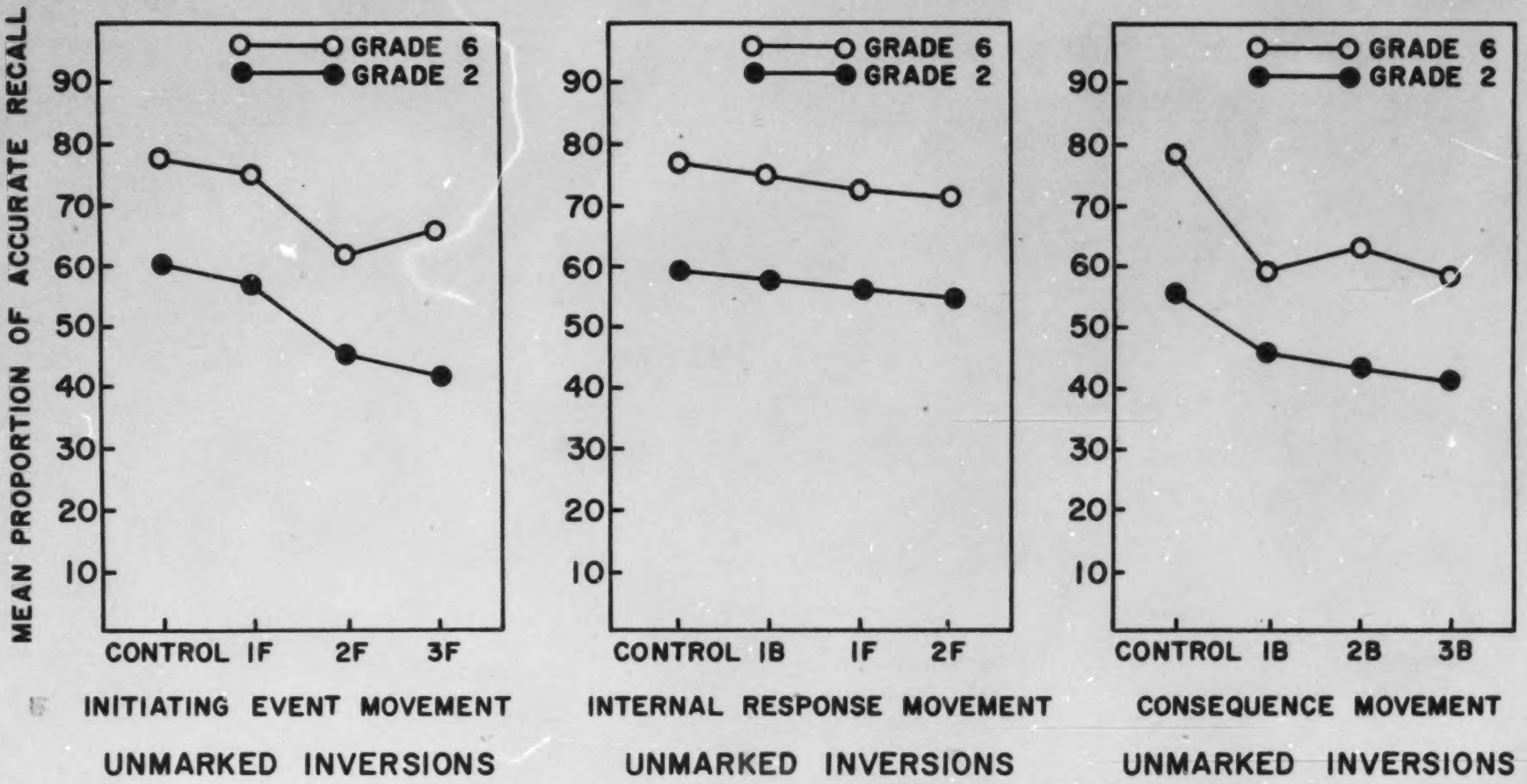
Figure 1. Mean proportion of statements accurately recalled in the control and experimental conditions when unmarked story deviations were presented to 2nd and 6th graders. From the Stein and Glenn (1978) study.

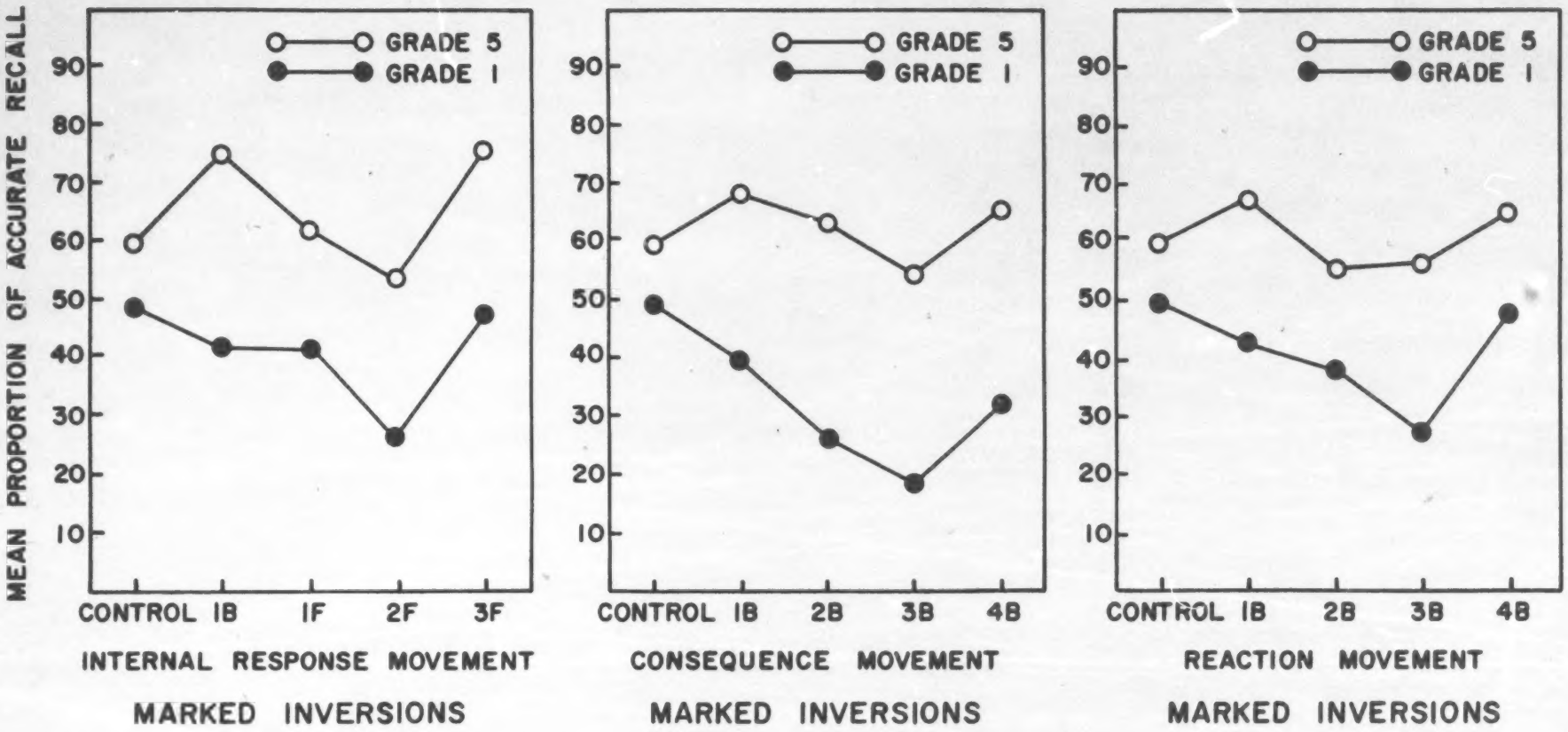
Figure 2. Mean proportion of statements accurately recalled in the control and experimental conditions when marked story deviations were presented to 1st and 5th graders. From the Stein and Nezworski (1978) study.

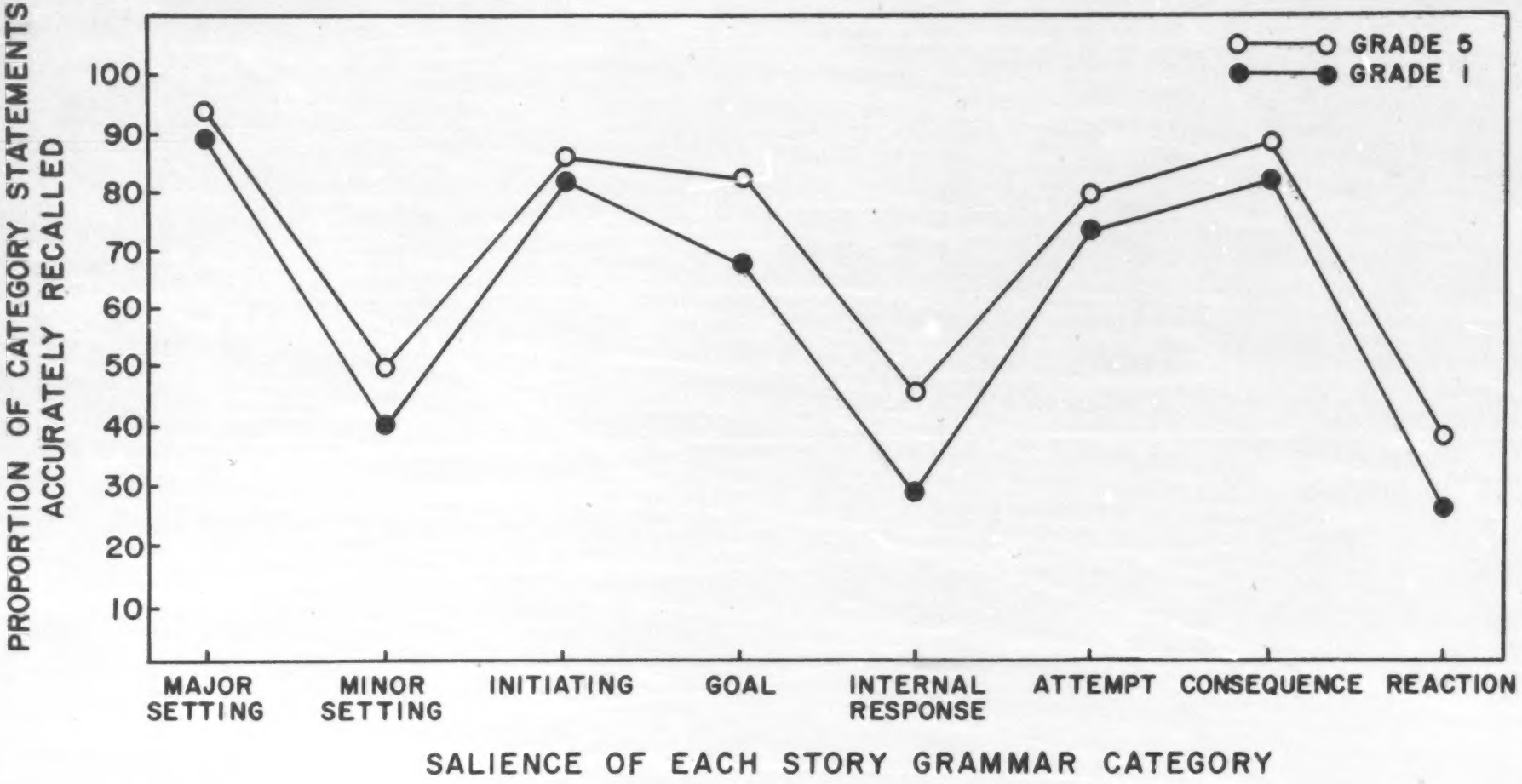
Figure 3. Mean proportion of statements recalled from each category when stories constructed according to the expected sequence were presented to 1st and 5th graders. From the Stein and Glenn (1977a) study.

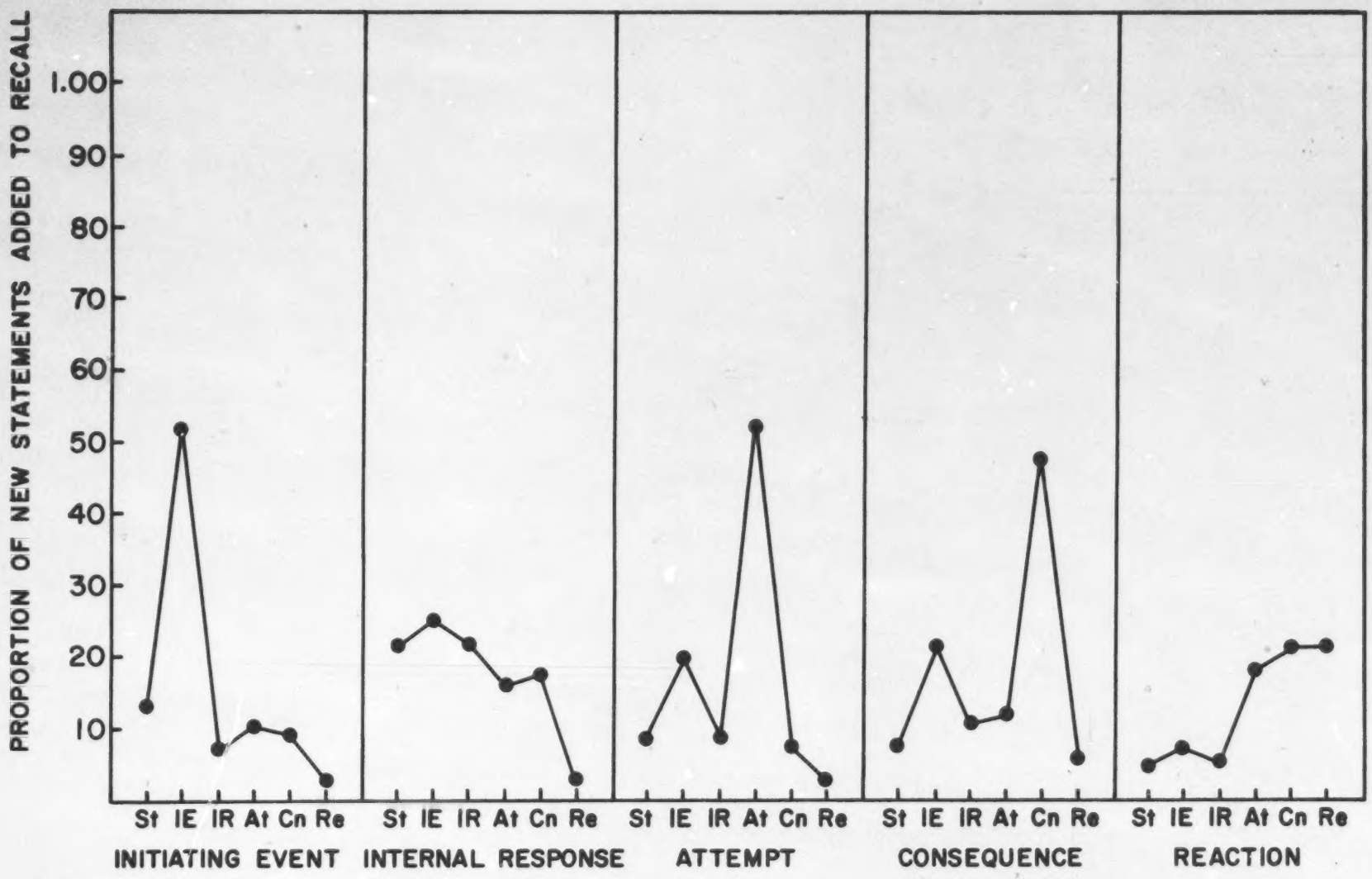
Figure 4. Proportion and category classification of new statements added to recall when each one of five categories (initiating event, internal response, attempt, consequence, reaction) was deleted from the text structure of a story. These data are combined across 1st and 5th grades. From Stein and Glenn (1977b).

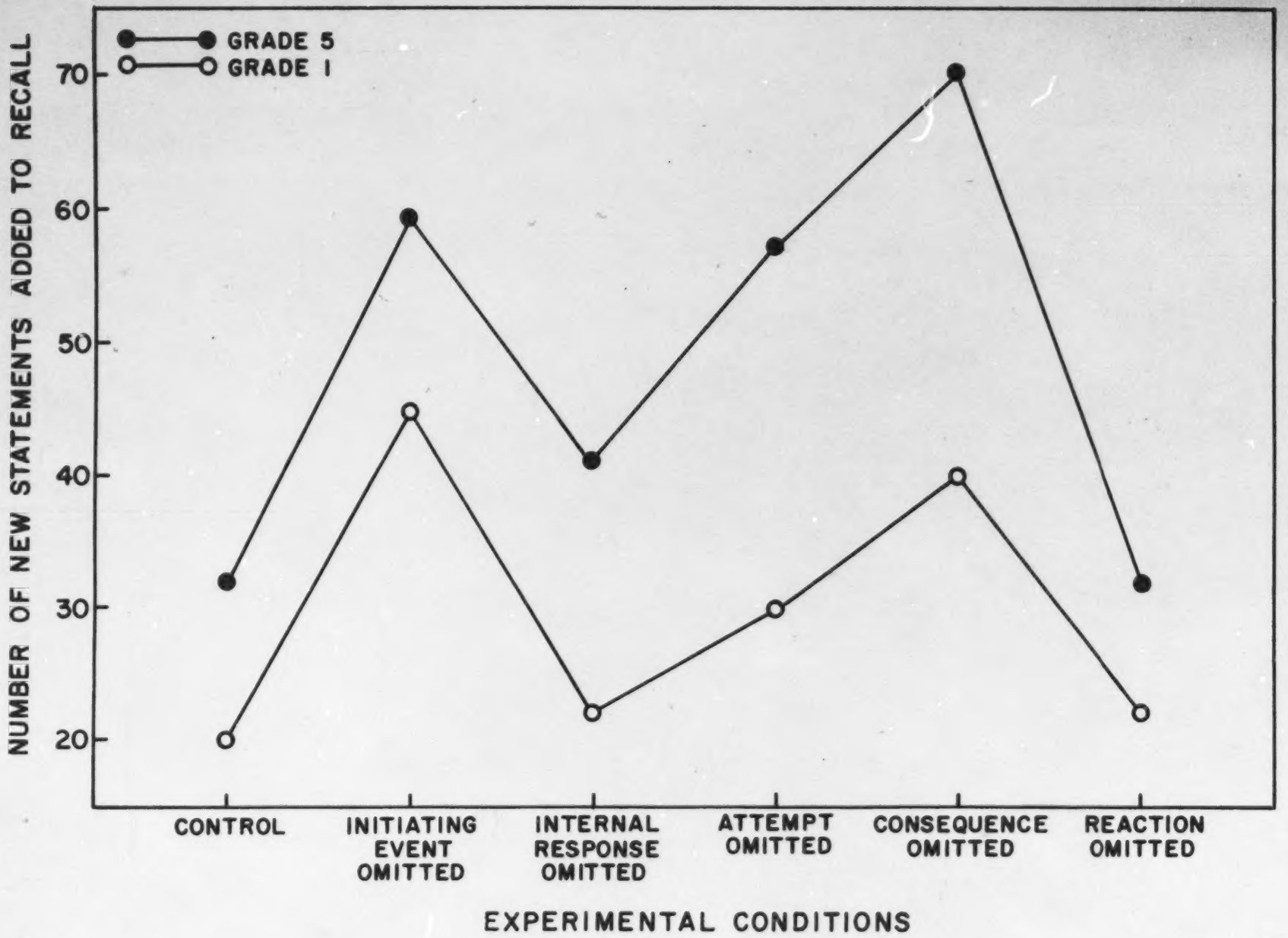
Figure 5. Number of new statements added to recall when each one of five categories was deleted from the text structure of stories presented to 1st and 5th graders. From Stein and Glenn (1977b).


MEAN PROPORTION OF ACCURATE RECALL
GRADE 6
GRADE 2
90
80
70
60
50
40
30
20
10
CONTROL 1F 2F 3F
INITIATING EVENT MOVEMENT
UNMARKED INVERSIONS
CONTROL 1B 1F 2F
INTERNAL RESPONSE MOVEMENT
UNMARKED INVERSIONS
CONTROL 1B 2B 3B
CONSEQUENCE MOVEMENT
UNMARKED INVERSIONS


MEAN PROPORTION OF ACCURATE RECALL
GRADE 5
GRADE 1
90
80
70
60
50
40
30
20
10
CONTROL 1B 1F 2F 3F
INTERNAL RESPONSE MOVEMENT
MARKED INVERSIONS
GRADE 5
GRADE 1
CONTROL 1B 2B 3B 4B
CONSEQUENCE MOVEMENT
MARKED INVERSIONS
GRADE 5
GRADE 1
CONTROL 1B 2B 3B 4B
REACTION MOVEMENT
MARKED INVERSIONS


GRADE 5
GRADE 1
PROPORTION OF CATEGORY STATEMENTS ACCURATELY RECALLED
100
90
80
70
60
50
40
30
20
10
MAJOR SETTING
MINOR SETTING
INITIATING
GOAL
INTERNAL RESPONSE
ATTEMPT
CONSEQUENCE
REACTION
SALIENCE OF EACH STORY GRAMMAR CATEGORY


PROPORTION OF NEW STATEMENTS ADDED TO RECALL
1.00
90
80
70
60
50
40
30
20
10
St IE IR At Cn Re
INITIATING EVENT
INTERNAL RESPONSE
ATTEMPT
CONSEQUENCE
REACTION


GRADE 5
GRADE 1
NUMBER OF NEW STATEMENTS ADDED TO RECALL
70
60
50
40
30
20
CONTROL
INITIATING EVENT OMITTED
INTERNAL RESPONSE OMITTED
ATTEMPT OMITTED
CONSEQUENCE OMITTED
REACTION OMITTED
EXPERIMENTAL CONDITIONS

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